CLAIMS:

1. Method for calculating a clogging factor of a filter composed of hollow-fiber membrane, which has a blood inflow portion and a blood outflow portion, for filtering a blood by passing said blood, said method comprising the steps of:

measuring at least two pressure selected from the group consisting of a pressure in said blood inflow portion, a pressure in said blood outflow portion, a filtering pressure in said blood inflow portion, and a filtering pressure in said blood outflow portion; and

calculating a filter clogging factor indicating the reduction in flowing ease of the blood in said filter and/or a filter clogging factor indicating the reduction in ease of filtering of said filter, by using the measured pressure.

2. Method for calculating a clogging factor of a filter according to claim 1, wherein a filter clogging factor indicating the reduction in flowing ease of the blood in said filter is calculated by using a viscosity of blood.

3. Method for calculating a clogging factor of a filter according to claim 1, wherein a filter clogging factor indicating the reduction in ease of filtering of said filter is calculated by using a viscosity of liquid waste.

4. Method for calculating a clogging factor of a filter according to claim 1, wherein a filter clogging factor indicating the reduction in flowing ease of the blood in said filter is calculated by using structure information and/or flow rate information of said filter.

5. Method for calculating a clogging factor of a filter according to claim 1, wherein a filter clogging factor indicating the reduction in ease of filtering of said filter is calculated by using structure information and/or flow rate information of said filter.

6. Method for calculating a clogging factor of a filter according to claim 2 or 4, wherein a filter clogging factor [F(%)], which the reduction in flowing ease of the blood in said filter is represented by the decreasing rate in a cross sectional area inside

said hollow-fiber, is calculated by using the Equation (1):

$$F=100\{1-[10^{-9} \cdot K \cdot l \cdot \eta_b \cdot (Q_b-Q_f/2)/N/\Delta P_b'/\pi]^{0.5}/R_0^2\}$$

Equation (1)

where K represents a correction coefficient (-), η_b represents viscosity(Pa·sec) of the blood, Q_b represents flow rate(ml/min) of the blood flowing into the filter, Q_f represents filtering flow rate (ml/min), N represents the number of hollow-fibers (-), $\Delta P_b'$ represents a difference(mmHg) of the pressure between both ends of the hollow-fiber, l represents an effective length(m) of the hollow-fiber, and R_0 represents the radius (m) inside the hollow-fiber that the clogging does not occur.

7. Method for calculating a clogging factor of a filter according to claim 2 or 4, wherein a filter clogging factor [F(%)] which the reduction in flowing ease of the blood in said filter is represented by the decreasing rate in a cross sectional area inside said hollow-fiber is calculated by using the Equation (2):

$$F=100\{1-[K' \cdot \eta_b \cdot (Q_b-Q_f/2)/\Delta P_b']^{0.5}\}$$

Equation (2)

where K' represents a correction coefficient (-), η_b represents viscosity(Pa · sec) of the blood, Q_b represents flow rate(ml/min) of the blood flowing into the filter, Q_f represents filtering flow rate (ml/min), and $\Delta P_b'$ represents a difference(mmHg) of the pressure between both ends of the hollow-fiber.

8. Method for calculating a clogging factor of a filter according to claim 1, 2, 4,6 or 7, wherein, a filter clogging factor indicating the reduction in flowing ease of the blood in said filter is calculated in real-time.

9. Method for calculating a clogging factor of a filter according to claim 3 or 5, wherein a filter clogging factor [f(%)], which the reduction in ease of filtering of said filter is represented by the decreasing rate in a cross sectional area of pore of said hollow-fiber, is calculated by using the Equation (3):

$$f=100[1-(10^{-9}\cdot k\cdot \tau\cdot \Delta X\cdot \eta_w\cdot Q_f/r_0^2/A_k/A_m/\Delta P_w')^{0.5}]$$

Equation (3)

where k represents a correction coefficient (-), τ represents a rate of curved path, ΔX represents a thickness of a membrane, η_w represents a viscosity of liquid waste passing a filter(Pa · sec), Q_f represents filtering rate(ml/min), r_0 represents the radius (m) of a hollow-fiber membrane pore that the clogging does not occur, ΔP_w' represents a difference of the pressure between the blood side end and the liquid waste side end in the membrane pore of the filter(mmHg), A_k represents a proportion of a cross sectional area of the membrane pore to a unit area of the membrane in the filter, and A_m represents an area(m^2) of the membrane in the filter.

10. Method for calculating a clogging factor of a filter according to claim 3 or 5, wherein a filter clogging factor [f(%)], which the reduction in ease of filtering of said filter is represented by the decreasing rate in a cross sectional area of pore of said hollow-fiber, is calculated by using the Equation (4):

$$f=100[1-(k'\cdot \eta_w\cdot Q_f/\Delta P_w')^{0.5}]$$

Equation (4)

where k' represents a correction coefficient (-), η_w represents a viscosity of liquid waste passing a filter(Pa · sec), Q_f represents filtering rate(ml/min), r represents the radius (m) of a hollow-fiber membrane pore that the clogging does not occur, and ΔP_w' represents a difference of the pressure between the blood side end and the liquid waste side end in the membrane pore of the filter(mmHg).

11. Method for calculating a clogging factor of a filter according to claim 1, 3, 5,9 or 10, wherein, a filter clogging factor indicating the reduction in ease of filtering of said filter is calculated in real-time.

12. Method for calculating a clogging factor of a filter according to claim 1,2,4 or 8, wherein a filter clogging factor [S(-)] which the reduction in flowing ease of the blood in said filter is represented by the decreasing rate in a cross sectional area inside said hollow-fiber is calculated by using the Equation (5):

$$S=[\eta_b \cdot (Q_b-Q_f/2) \cdot \Delta P_{b0}'/\ \eta_{b0}/(Q_{b0}-Q_{f0}/2)/\Delta P_b']^{0.5}$$

Equation (5)

wherein η_b represents viscosity(Pa・sec) of the blood flowing in the hollow-fiber, η_{b0} represents viscosity(Pa・sec) of the priming liquid in the priming, Q_b represents flow rate(ml/min) of the blood flowing into the filter, Q_{b0} represents flow rate(ml/min) of the priming liquid flowing into the filter in the priming, Q_f represents filtering flow rate (ml/min), Q_{f0} represents filtering flow rate (ml/min) in the priming, $\Delta P_b'$ represents a difference(mmHg) (Pa-Pv) of the pressure between both ends of the hollow-fiber, and $\Delta P_{b0}'$ represents a difference(mmHg) of the pressure between both ends of the hollow-fiber in the priming.

13. Method for calculating a clogging factor of a filter according to claim 1,3,5 or 11, wherein a filter clogging factor [s(-)] which the reduction in ease of filtering of said filter is represented by the decreasing rate in a cross sectional area of membrane pore of said hollow-fiber is calculated by using the Equation (6):

$$s=(\eta_w \cdot Q_f \cdot \Delta P_{w0}'/\ \eta_{w0}/Q_{f0}/\Delta P_w')^{0.5}$$

Equation (6)

wherein η_w represents viscosity(Pa・sec) of the liquid waste, η_{b0} represents viscosity(Pa・sec) of the liquid waste in the priming, Q_f represents filtering flow rate (ml/min), Q_{f0} represents filtering flow rate (ml/min) in the priming, $\Delta P_w'$ represents a difference(mmHg) of the pressure between blood side end and liquid waste side end of the hollow-fiber membrane pore, $\Delta P_{w0}'$ represents a difference(mmHg) of the pressure between blood side end and liquid waste side end of the hollow-fiber membrane pore in the priming, and s represents a ratio of cross sectional areas in the hollow-fiber membrane pore of the filter.

14. Method for calculating a clogging factor of a filter according to claim 1,3,5,11 or 13, wherein, an average of $\Delta P_w'$ in said blood inflow portion and $\Delta P_w'$ in said blood outflow portion is used as $\Delta P_w'$.

15. Method for monitoring a clogging of a filter comprising the steps of:

calculating a clogging factor of a filter by using a method for calculating a clogging factor of a filter according to any one of claim 1 to 14; and

monitoring a clogging of a filter on the basis of the clogging factor of a filter.

16. Apparatus of monitoring a clogging of a filter comprising :

means for calculating a clogging factor of a filter by using a method for calculating a clogging factor of a filter according to any one of claim 1 to 14; and

means for monitoring a clogging of a filter on the basis of the clogging factor of a filter.

17. Bed-side system comprising apparatus of monitoring a clogging of a filter according to claim 16.